1-Wire RGB Controller

User Manual

July 2013

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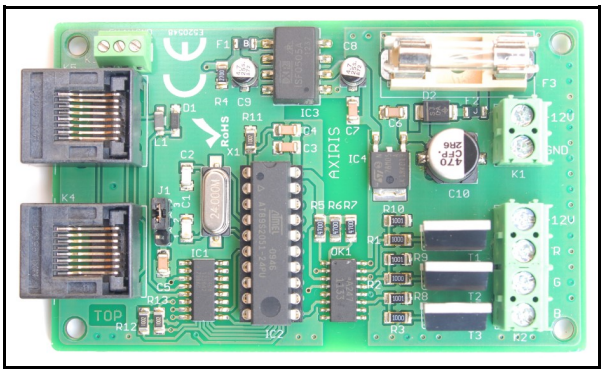
Revision History

Date	Authors	Description
2013-03-06	Peter S'heeren	Initial release.
2013-04-28	Peter S'heeren	Added section about software support. Second release.
2013-07-21	Peter S'heeren	Added section about owfs software support. Third release.

1 Features



- Three individually controllable PWM output channels able to directly drive a 12V LED RGB strip.
- Approx. 1000 Hz PWM cycle frequency.
- PWM duty cycle adjustable from 0 % to 99.61 %.
- PWM duty cycle changes are free of glitches avoiding visual flickering.
- PWM signals are shifted 120 degrees for optimal power distribution.
- Separate circuits for 1-Wire and 12 V RGB.
- A fuse protects the 12 V RGB circuit.
- Three connection points for 1-Wire cabling and wiring.
- Drives RGB LED strips up to 4 A per channel (for a max. total of 144 W).

2 Technical Specifications

Weight	45 g (with fuse)
Dimensions	92 mm x 55 mm x 25 mm (W x D x H)

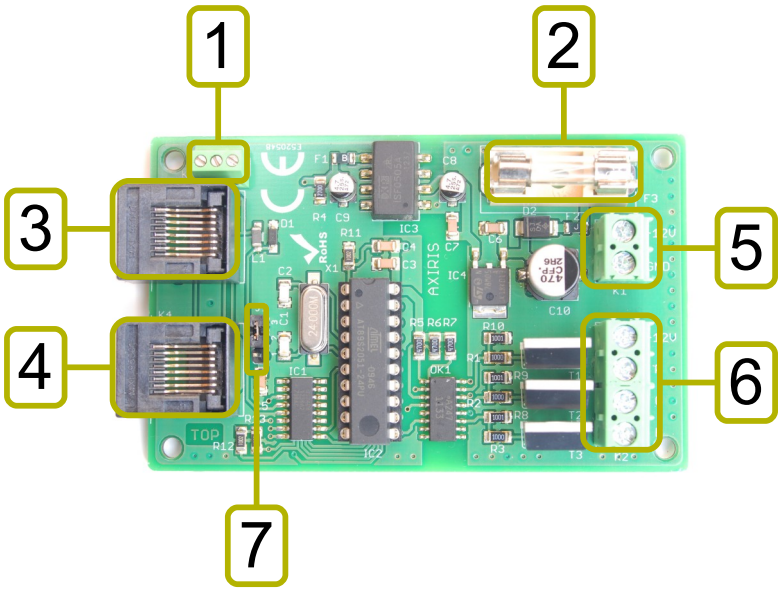
3 Warnings

WARNINGS!

- Beware the polarity of the power connector, do not inverse.
- This device is not suitable for driving 24 V LED strips.

4 1-Wire RGB Controller

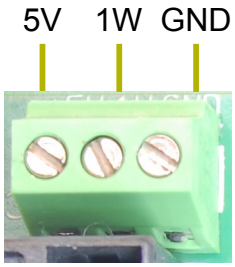
Board Overview



Mark	Label	Description
1	K3	1-Wire bus terminal block connector
2	F3	Fuse 10 A (max 12 A allowed)
3	K5	1-Wire bus RJ45 connector
4	K4	1-Wire bus RJ45 connector
5	K1	Power connector to supply the RGB outputs
6	K2	RGB outputs
7	J1	Power supply selection for the 1-Wire slave

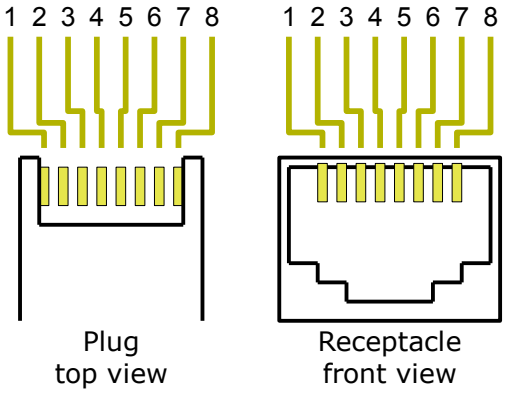
1-Wire Terminal Block Connector (K3)

Mark	Description
5V	5 V supply
1W	1-Wire DQ line (data)
GND	Ground



1-Wire RJ45 Connectors (K4, K5)

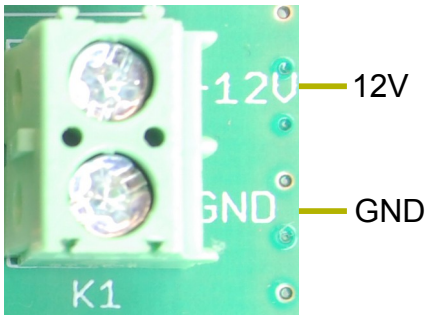
Mark	Description
1	Unassigned
2	+5 V power
3	Unassigned
4	1-Wire DQ (data)
5	1-Wire ground
6	Unassigned
7	Unassigned
8	Unassigned



All eight pins are routed between the two connectors. The RGB controller doesn't use the unassigned lines.

Power Connector (K1)

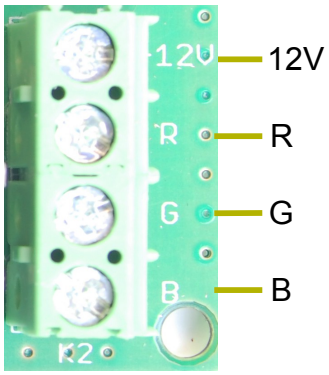
Mark	Description
12V	12 V input
GND	Ground



Connect the 12 V power source for the RGB outputs to this connector.

RGB Outputs Connector (K2)

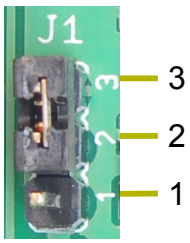
Mark	Description
12V	12 V output
R	Red channel output
G	Green channel output
B	Blue channel output



The 12 V output is derived from the 12 V input on K1 and fuse-protected (see F3).

1-Wire Slave Power Selection (J1)

1	2	3	Description
▬			External power
	▬		Parasite power



This jumper determines how the 1-Wire slave is powered:

- External power: the 1-Wire slave draws power from the 5V line. Be sure the voltage is provided to one of the 1-Wire connection points (K3, K4, K5).
- Parasite power: the 1-Wire slave uses an internal capacitor as its power source. The capacitor is charged during idle time (DQ line held high) and provides power during bus activity. The 5V line (K3, K4, K5) is not applicable.

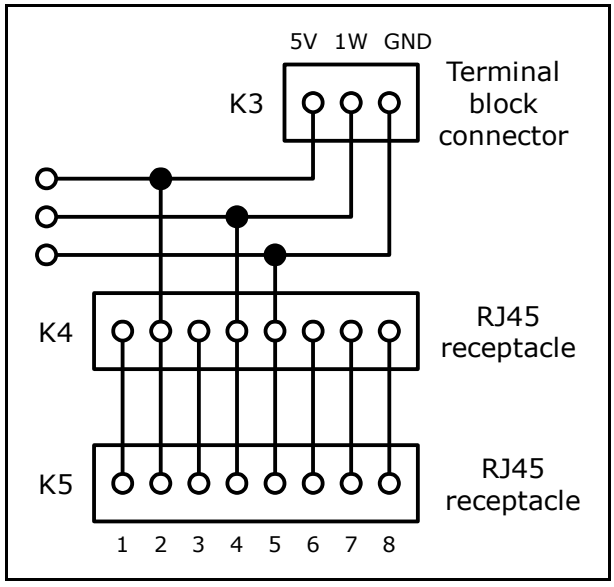
See the 1-Wire specification for more information.

1-Wire Connectivity

The RGB controller provides three connection points for 1-Wire cabling and wiring.

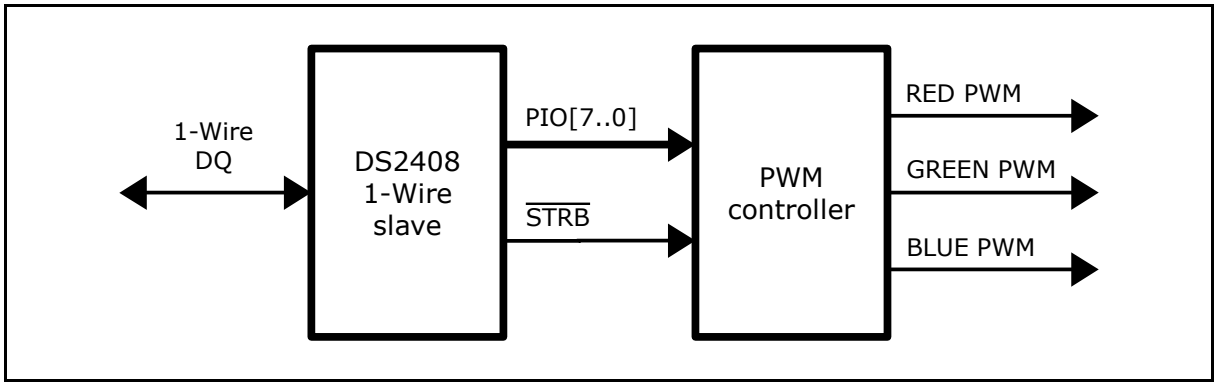
The terminal block connector is typically used for wiring the RGB Controller to an AbioWire or another 1-Wire adapter.

The RJ45 receptacles provide a means to set up a 1-Wire bus in daisy chain using UTP cables.



Communications Protocol

The 1-Wire slave function on the RGB controller is a Maxim DS2408 chip. The 1-Wire slave is connected to the PWM controller.



See the Maxim DS2408 datasheet for more information about the 1-Wire slave chip.

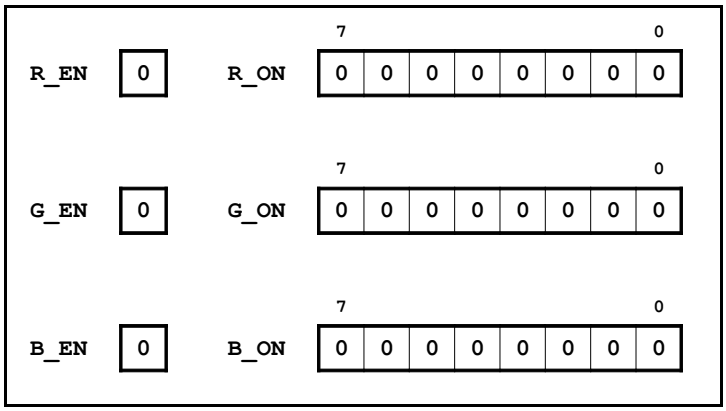
The PWM controller generates three individual output signals with a 256-step cycle at approx. 1000 Hz and a duty cycle adjustable from 0 % to 99.61 %.

The host system sends command bytes over the 1-Wire bus to the PIO lines of the DS2408. The DS2408 generates an output strobe ($\overline{\text{STRB}}$ line) to inform the PWM controller a command byte is available.

The host system must ensure the RSTZ pin on the DS2408 is configured as $\overline{\text{STRB}}$. DS2408 control/status register bit 2 – ROS: RSTZ Pin Mode Control – configures the RSTZ pin.

The PWM controller maintains a set of registers the host system can write data into:

- R_EN: Red channel enable.
- G_EN: Green channel enable.
- B_EN: Blue channel enable.
- R_ON: Red PWM ON period.
- G_ON: Green PWM ON period.
- B_ON: Blue PWM ON period.



The reset values are shown.

The ON period registers determine the duty cycle of each output signal. A value of zero means 0/256 or 0 %, a value of 255 means 255/256 or 99.61 %.

The enable registers control the enable state of each output signal. The enable state overrule the ON period. A value of zero means the output signal is disabled, a value of one means the output generates a signal with the programmed duty cycle.

When data is written to the ON period registers, the generated PWM output signals won't change immediately. The host system has to send the commit command to order the PWM controller to make the register values effective.

The commit command also embeds the enable register values. This means, unlike writing

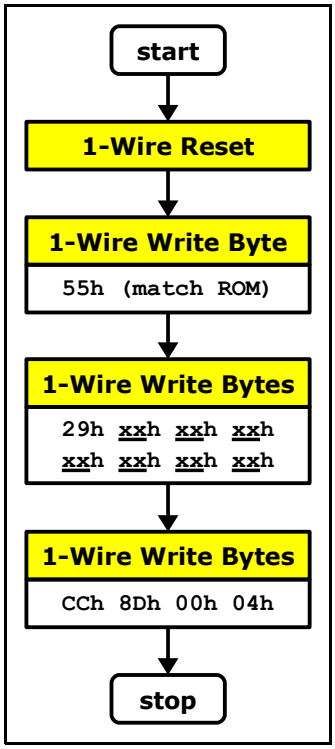
data to an ON period register, writing data to the enable registers immediately takes effect.

Command Byte								Function
7	6	5	4	3	2	1	0	
R_ON[7..4]				0	0	0	0	Set red ON period high nibble
R_ON[3..0]				0	0	0	1	Set red ON period low nibble
G_ON[7..4]				0	0	1	0	Set green ON period high nibble
G_ON[3..0]				0	0	1	1	Set green ON period low nibble
B_ON[7..4]				0	1	0	0	Set blue ON period high nibble
B_ON[3..0]				0	1	0	1	Set blue ON period low nibble
0	B_EN	G_EN	R_EN	0	1	1	0	Set RGB enable flags and commit

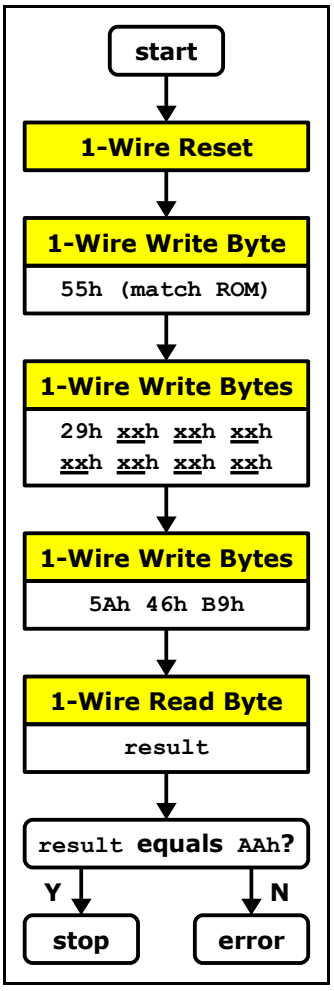
The family code of the DS2408 is 29h. Since the family code alone doesn't uniquely identify a 1-Wire RGB Controller device, the host system must associate the full 8-byte ROM code with the device.

The host system is expected to use Standard speed when communicating with the RGB controller over the 1-Wire bus.

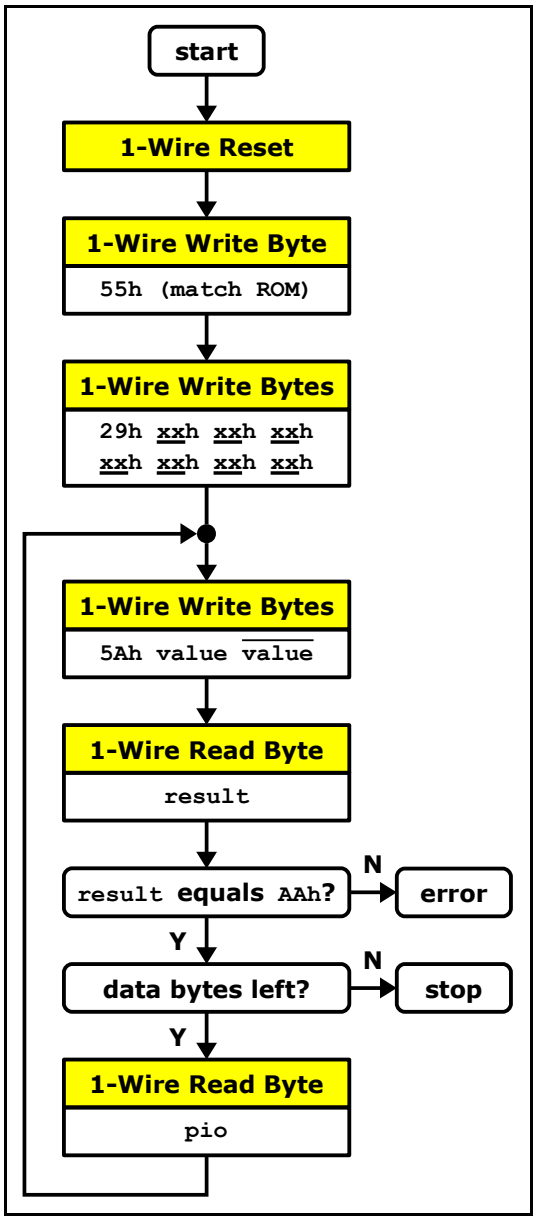
The host system needs to execute the following 1-Wire command sequence in order to configure the RSTZ pin on the DS2408 as $\overline{\text{STRB}}$.



The following diagram shows how to write byte value 46h to the RGB controller.



The following diagram shows how to write a string of byte values to the RGB controller.



5 Software Support

ows

Software package **ows** v1.0.0 and later includes program **owrgctrl**. This program enables you to fully control the 1-Wire RGB Controller.

Example invocations of the program:

```
> owrgbctrl.exe -lu -id 29-11CEE1 -c
```

This command clears all internal registers of the target 1-Wire RGB controller.

```
> owrgbctrl.exe -lu -id 29-11CEE1 -ro 20 -go 50 -bo 80
```

This command sets the internal RGB registers of the target 1-Wire RGB controller to (20;50;80).

Specify **-v** to see the actual command bytes that are written to the RGB controller.

owfs

It's assumed you're using the filesystem client of the **owfs** package. In the examples it's suppose you've specified **/mnt/onewire/** as the mount directory for the 1-Wire file system.

Since owfs inverts all accesses to PIO channels, the default positive logic becomes negative logic and one has to invert all command values before sending them out.

```
# Mount point for owfs
OWFS_MNT=/mnt/onewire

# ROM code
OWRGBCTRL_ROMCODE=29.E1CE11000000

# Configure pin RSTZ as STROBE output
echo "1" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/strobe

# Set red to 20 = 14h:   10h -> invert => EFh = 239
#                        41h -> invert => BEh = 190
# Set green to 50 = 32h: 32h -> invert => CDh = 205
#                        23h -> invert => DCh = 220
# Set blue to 80 = 50h:  54h -> invert => ABh = 171
#                        05h -> invert => FAh = 250
# Enable R,G,B & commit: 76h -> invert => 89h = 137
#
echo "239" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
echo "190" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
echo "205" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
echo "220" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
echo "171" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
echo "250" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
echo "137" > $OWFS_MNT/$OWRGBCTRL_ROMCODE/PIO.BYTE
```

This shell script excerpt sets the internal RGB registers of the target 1-Wire RGB controller to (20;50;80).

6 Disclaimer

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7 Contact Information

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